

Road Map Summary



Value
to
Wood

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Challenges and Opportunities for Engineered Wood Products Manufacturers



Photo: www.bcforestinformation.com

This sector comprises engineered wood products (EWP) such as Glulam, LVL, Timberstrand and I-joists that are manufactured to offer improved structural properties over sawn lumber members. A team of researchers interviewed Canadian EWP manufacturers for their vision of their industry and the innovation needed to support its continued health. The team then consulted key university and Forintek researchers to review the challenges facing the industry and to brainstorm for additional innovations. The information presented in this report is part of a larger work "Roadmap for the Canadian Value-added Industry" available from FPInnovations – Forintek Division.

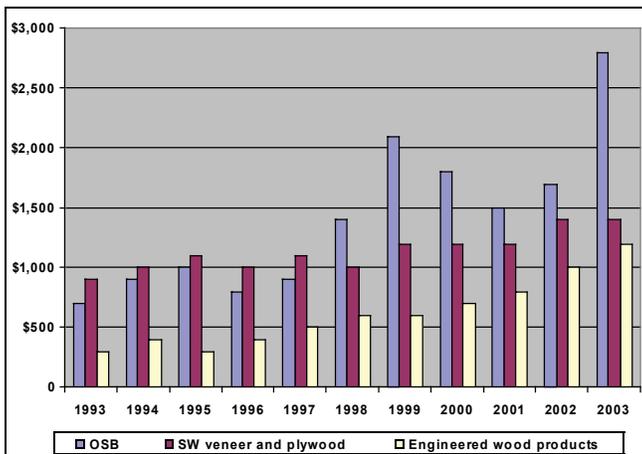


Natural Resources
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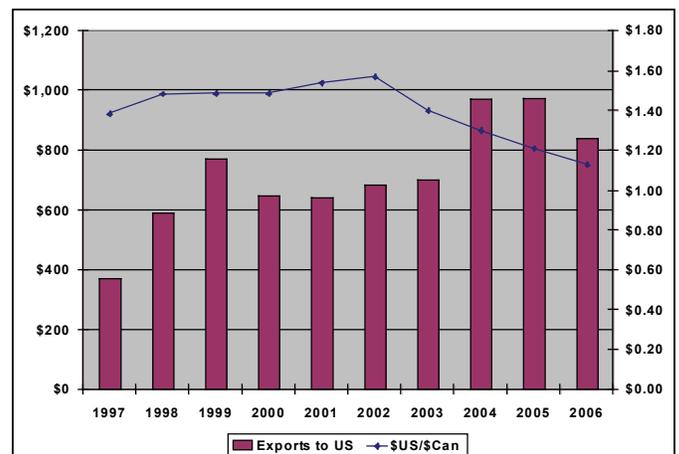
Ressources naturelles
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The Engineered Wood Product Industry At-a-Glance

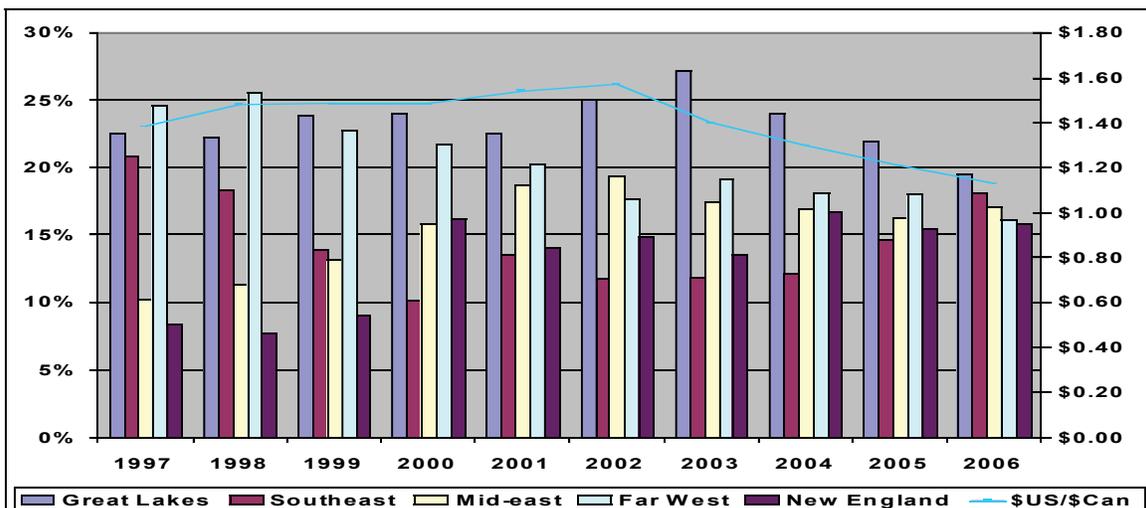
- Statistics Canada does not collect information that distinguishes among engineered wood products (EWP) and roof and floor trusses. Similarly data on the small volumes of exports and imports of engineered wood products has not been tracked separately. Statistics presented in this report serve primarily as an indication of the scale of the industry and include all wood trusses.
- EWP shipments in Canada in 2003 were \$1.2 billion, about 8% of total lumber shipments.
- Exports accounted for roughly 60% of shipments; 98% of Canada's exports were sent to the US.
- Imports of EWP to Canada were only about \$72 million; equivalent to about 6% of Canadian shipments.
- In 2006, exports of EWP had grown to \$859 million (from \$729 million in 2003) with Quebec leading the provinces in exports with a 41% share, followed by Ontario, New Brunswick and British Columbia with 25%, 16% and 14%, respectively. Reductions in exports appear to be more a result of the poor US housing market rather than the weakening US dollar.



Shipments of the engineered wood products and structural boards (in \$ millions). Source: Industry Canada, 2007.



Canadian EWP exports to US (in \$ millions). Source: Industry Canada and Bank of Canada, 2007.



Canadian EWP exports to the top five US regions (in \$ millions). Source: Industry Canada, 2007.

Industry Vision and Driving Forces

Building Performance-based Innovation

Traditional research on engineered wood products (EWP) and prefabricated components has focused on enhancing physical product properties and improving overall building performance. Research on individual products still needs to be done to: impart new properties to structural products (including resins and adhesives); improve product design; design for whole-house using strictly EWP and prefabricated components; and devise connectors and anchors that improve overall building performance.

According to manufacturers...

- The design and development of new products is key to the EWP industry's success. Some companies expressed the need to see value-added products as a means of developing alternative processes/products rather than as a means to help sell primary products. While the industry should continue to explore ways to add value to existing primary products, there is a strong need to look at different ways to convert available forest products into desired end products. Canadian manufacturers would certainly gain from a better knowledge of European companies' product generations and multi-material products. Flexible European product standard codes were said to have a considerable impact on product development and innovation in general. One of the industry's next steps could be to standardize its products. Canadian innovations are generally tested in-house.
- Companies looking at developing new products are looking at ways to improve the performance of their products by reinforcing them with alternative species (tamarack, aspen and red maple) or with other non-wood materials (i.e., carbon fibre). Improved adhesives and quality control measures are other areas that could help manufacturers improve product performance.
- There may be an interest to develop EWP (i.e., glulam) that act as both structural and appearance products. Manufacturing challenges standing in the way of this idea include current glue line colours, planer skips resulting from variable moisture contents, finish durability (weathering and fire) and matching repairs when the finish is applied.

Manufacturing and Cost Efficiencies

Cost reductions and increased efficiency are permanent drivers of innovation in the Canadian value-added wood products industry. Historically, improvements in this area focused on finding low-cost alternative materials as well as designing technology that could perform manufacturing operations faster, more precisely and at a lower cost than using manual labour. Similarly, improvements were continuously sought with regard to the actual operations performed in factories, i.e., scanning (optimization), sawing, gluing, laminating, sanding, finishing, assembly, etc. However, today's search for efficiency gains encompasses the whole spectrum of operations and material inputs used by a company (i.e., packaging).

According to manufacturers...

- EWP manufacturers are always looking to lower their production costs. A significant proportion of their costs are labour related since automation has made relatively limited inroads in the industry. Gains can still be made by decreasing the number of interruptions on the production line as well as minimizing human decision-making. Interest has also been shown regarding minimizing product inventory to make purchasing, production, ordering and distribution more efficient.
- Alternative sources of energy and reduced energy consumption would be a second step in reducing manufacturing costs. Potential environmental benefits resulting from reduced energy consumption are also interesting from an industry standpoint.

Customer Focus (key specifiers)

The structural products sector's ability to innovate is still highly dependent on the products the sawmilling industry produces. In many cases, value-added structural products are perceived by the primary industry as a means to sell more primary products. One of the weaknesses of the structural products sector resides in its limited ability to reach those specifiers who are key to increased product use, especially for non-residential markets.

According to manufacturers...

- One of the main barriers limiting EWP market presence is the designers' lack of familiarity and experience with wood as a structural material for large projects. Many business representatives highlighted the weak North American wood design culture. The industry is interested in increasing the promotion for its products/systems in both domestic and export markets. The United Kingdom's Building Research Establishment (BRE) was cited as a good example that could be applied in Canada. Industry promotion targeting key specifiers could focus on the increased spans offered by EWP.
- Marketing is a key element in selling EWP, yet most manufacturers feel they need more critical market information to develop strategies and give direction to their business activities. For instance, knowledge of negative perceptions vis-à-vis performance of I-joists in fires could affect product mix, product development and marketing strategies. Another example of the importance of market intelligence for foreign markets is the UK trends supporting screwing and bolting as preferred mechanical connections and the predisposition/acceptance for packaged wall panels.
- EWP manufacturers believe the market for their product will continue to grow over the long term as there is considerable room for growth in the US market (non-residential in particular). However, references to industry conservatism seem to suggest that EWP markets will first need to develop before large companies decide to pursue these products instead of the traditional 2x3, 2x4, etc. Transportation costs are a key issue for EWP producers who are interested in exporting their products.

Environmental, Health, Social and Governance Issues

Canadian manufacturers of value-added structural products must comply with continually evolving codes and standards to ensure there is a negligible risk to consumer health and safety in the final product. Designers and other key specifiers (corporate and municipal) are increasingly demanding that the products they buy be made from wood that is harvested according to environmentally and socially acceptable procedures. The gradual implementation of environmental and social standards will affect the way both residential and non-residential buildings are built.

According to manufacturers...

- The industry shares many concerns over the threat of inadequate fire resistance of EWP and adhesives.
- Many producers feel they do not have the appropriate resources to deal with green building trends that are emerging in Europe and will eventually be coming to North America. In its current state, the industry does not feel prepared to step up to these challenges.
- The EWP industry is active in the development of codes and standards. Yet many companies feel that standards that are too restrictive/prescriptive can slow down the industry's development and affect its ability to compete. Standards should support innovation by giving guidelines for products that are being developed (support). They should be broad enough to accommodate innovation.

Resource Issues (supply and characterization)

Aside from the decision to change species for financial reasons, many appearance structural wood products' manufacturers are being forced to change their materials and grade mix in response to limited supplies of appropriate raw materials, and to improve manufacturing efficiencies and develop new products. This situation presents multiple challenges in making a product that is consistent and reliable, while respecting existing supply agreements.

According to manufacturers...

- Engineered wood products' manufacturers are struggling with fibre supply. Raw material costs are up, wood diameter is getting smaller and the overall quality and consistency (i.e., moisture content) of the resource is diminishing. MSR lumber users are concerned over its limited and unpredictable supply. Eastern glulam manufacturers are struggling to source lamstock. Recent reductions in Quebec's annual allowable cut should make this situation worse than it already is, but will likely force manufacturers to focus on efficiency improvements. Some manufacturers may consider increasing their inventory to counter supply fluctuations.
 - Fluctuating prices for flange and web supply is problematic since the price of end products is often locked for periods ranging between three to six months. While some companies are considering the use of finger-jointed material as a low-cost alternative, others are looking at western 2x6 for ripping. LVL is currently too expensive to use in flange applications. Changes in material supply are prompting some manufacturers to re-evaluate the equipment they use.
 - The demand for green buildings and certified wood products is beginning to show up in EWP markets. Some countries, most notably the UK, are starting to require that imported wood be stamped to reflect its country of origin.
- The wood products industry tends to be conservative and places most of its emphasis on commodity products such as softwood lumber (2x3 and 2x4) and pulp and paper. EWP manufacturers would like to see a change in strategy towards more value-added structural products. Consequently, this strategy should translate into a long-term vision guiding forest utilization. This may mean investing in technologies other than sawmilling to use the forest.



Top Four Innovation Needs and Priorities of the Structural Product Industry

- Increasing the industry's design and product development capacities
- Optimizing lumber and raw material use
- Controlling quality in material inputs, manufacturing processes and products
- Improving the use of supply chain management in the industry

Innovations for the Engineered Wood Products Industry

Incremental innovations are refinements or improvements to existing technologies, products and processes. **Breakthrough innovations** are totally new ways of thinking and doing. They represent significant departures from current processes, technologies, equipment and products used in the industry.

The lists below represent only some of the innovations identified in this project. Please consult the *Roadmap* for a more extensive listing of possible innovations.

Market Access / Intelligence / Competitors

Incremental Innovations

- Evaluate the competitiveness of Canadian value-added structural products in export markets. Quantify transportation costs, taking into account container sizes and potential shipping methods.
- Stimulate product development by improving knowledge of OSL and OSB properties and their possible uses in EWP products or systems.
- Model the integration of primary, secondary (i.e., components) and tertiary transformation (supply chain integration).
- Develop a one-stop shop for all wood construction. In Europe, an information portal that can be accessed by key specifiers to find information on suppliers, regulations, etc. was mentioned as a successful extension example.

Codes, Standards, and Social Responsibility

Incremental Innovations

- Develop a green building implementation handbook.
- Critical analysis and development of a scientific basis for green building standards.
- Measure the impact of the shift towards green building on the building material industry.
- Measure the impact of the shift towards healthy buildings on the building material industry.
- Streamline product/connector evaluation and code acceptance.

Breakthrough Innovation

- Assist the Canadian forest products industry in the transition towards green building certification and the development of green building compliant building materials.

Design and Product Development

Incremental Innovations

- Develop hybrid building products to improve load-carrying capacities of wood products.
- Develop EWP using available wood resources (pulp wood, residues and underutilized species).
- Assess the feasibility of producing fingerjointed LVL.
- Develop a composite wood product that could be used in roof and floor trusses.
- Develop a connection system that would foster greater use of glulam.

Breakthrough Innovations

- Improve the treatment of large dimension glulam for decay, mold and termites.
- Study installation issues and improve product design to facilitate installation.
- Develop a whole building system that combines EWP elements and connectors/special components for assembly. The main obstacle to the emergence of this kind of product resides in the industry's lack of engineering support (training). The end product should be geared towards the non-residential market as this market segment holds the most development potential.

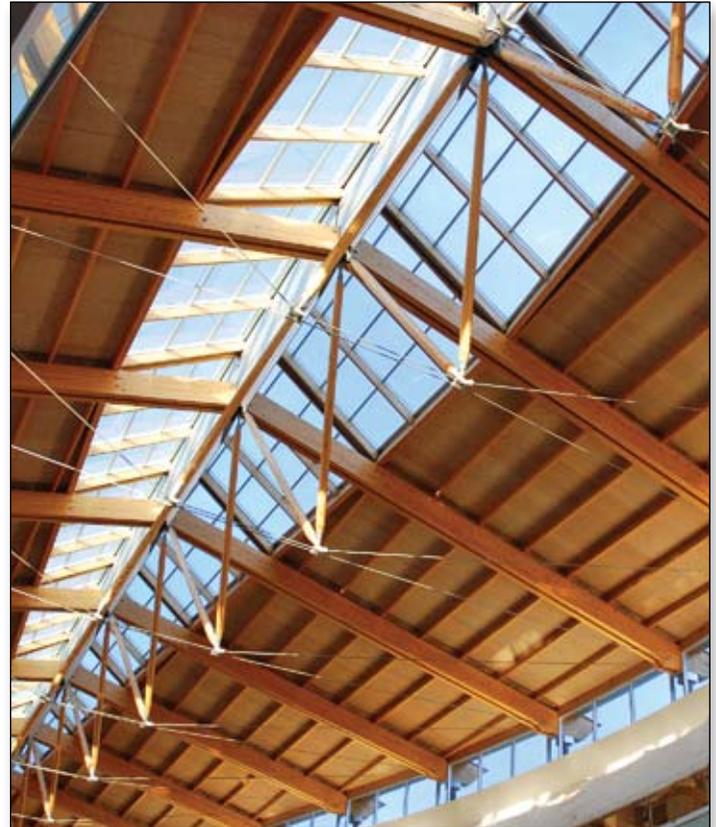


Photo: www.bcforestinformation.com

Material Supply and Properties

Incremental Innovations

- Study the effect of ripping of large MSR lumber to smaller sizes on new MSR values.
- Reduce the cost of adhesives by substituting phenol formaldehyde with lower cost materials or wood residues (natural adhesives).
- Determine the properties of old-growth and regrowth logs for processing and end product properties.

Skills and Training

Incremental Innovations

- Study the impact of wood engineering and architecture programs on the use of wood in structural applications and evaluate the impact of losing these university programs.
- Promote wood design in university curriculums.
- Develop training tools for technical staff to do quick quotes.

Breakthrough Innovation

- Support architectural training on wood buildings to encompass both the need to have professors specialized in wood engineering, and courses being taught at the university level (i.e., having the specialization offered).



Technology and Manufacturing

Incremental Innovations

- Optimize flange design based on wood optimization.
- Develop a technique to detect damaged wood recuperated from forest fires (growth rings tend to separate and wood is generally more difficult to machine).
- Optimize fingerjointing of lumber pieces with different stiffness.
- Study quality control techniques from input (material) to output (product).

Breakthrough Innovations

- Develop in-line non-destructive testing of structural products that is usable in an industrial setting and allows for the recuperation of product failures.
- Improve the performance of treatment of large dimension glulam against decay and termites.
- Demonstrate the rationale to switch from solid wood to EWP supply with a focus on future product development.

Reference

Lavoie, P.J.P., D. Fell and F. Laytner. 2006. Roadmap for the Canadian Value-added Industry. Prepared by Forintek Canada Corp. for Natural Resources Canada - Canadian Forest Service. 179 pp.

Value to Wood Research Program Partners



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As part of the *Value to Wood* program, funded by Natural Resources Canada, Forintek's Industry Advisors are providing technical services to value-added wood product manufacturers in all regions of Canada. Find out about upcoming workshops or seminars in your area by visiting us at www.valuetowood.ca or make a request for information on any technical issue related to wood product manufacturing via valuetowood.ca (Help Desk).

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